



The Lunar Disk

Purpose

To carefully look at, describe, and learn about the origins of the six lunar samples contained in the disk.

Background [also see "Teacher's Guide" Pages 1, 4-9, photo on 15, 16 and "About the Lunar Sample Disk" on Page iv]

The six **Apollo** missions that landed **astronauts** on the Moon returned a collection of **rocks** and **sediment** samples weighing 382 kilograms and consisting of more than 2,000 separate samples.

Each lunar disk contains six small samples of lunar material. Descriptions of the samples accompany every disk; included are annotated color photographs, discussion of origins, and Apollo missions and collection sites.

Preparation

First, do the "Reaping Rocks" activity on Page 33 or spend time on a basic unit on rock and mineral identification.

Read the rock descriptions provided with the Lunar Sample Disk.

Review and prepare materials listed on the student sheet.

Each student will need two copies of the "Lunar Disk Sample Chart," there is room for three samples per page. Use of magnifying lenses or a stereo microscope would greatly enhance observations.

Have on hand the students' "My Own Rock Charts" for comparisons to the lunar samples. You may also want to collect some sediment from the school yard to display on a glass slide. Students could then compare this sediment to the lunar samples. Most likely, evidence of life will be seen in the school yard sediment under magnification, including plant matter, bits of plastic, fibers, etc.

In Class

The Lunar Sample Disk is a national treasure and students need to be reminded about the proper way to handle it. The disk must be in your sight during use.

Encourage students to describe the samples with as many adjectives or descriptive phrases as possible. The "Lunar Disk Sample Chart" will help students organize their observations and interpretations.

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Note: The name of each sample is labeled on the disk and may be entered on the chart under *classification*. The sediment samples, instead of being labeled regolith, are labeled "soil." Remind the students this is a misnomer because there are no organic materials in lunar regolith.

Ask the students if their predictions of the Moon rocks were accurate.

Wrap-Up

By comparing the lunar samples with their own rock collections, students can discuss the similarities and differences between Earth and Moon rocks. Discuss the various ways that rocks are formed on Earth and the Moon.



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Key Words

anorthosite
mare basalt
orange “soil”
breccia
mare “soil”
highland “soil”

Materials

Lunar Disk
magnifying lens or stereo microscope
“Lunar Disk Sample Chart”
“My Own Rock Chart”
“Moon ABCs Fact Sheet”

Caution

The only way to handle the Lunar Sample Disk is with care.

Always place it on the soft cloth to prevent scratches to the surface. The disk must always be in the teacher's sight.

Care for and enjoy this national treasure.

Procedure

1. Look at each **lunar sample** with and without a **magnifying lens or stereo microscope**. What details can you see under magnification?
2. Describe what you see by filling out “**Lunar Disk Sample Chart**.” Use as many adjectives or descriptive phrases as you can.
3. Do the Moon rocks look like what you expected?

4. Which lunar samples closely resemble rocks from your collection?

5. Based on your comparisons of Earth and Moon rocks, what can you now say about the origins of the lunar samples contained in the disk? Add this information to your chart.

6. Which rock types on Earth are not found in the lunar samples? Why?

Lunar Disk Sample Chart

| Interpretations | | Observations | | | | | |
|-----------------|------------------------------------|------------------|--|--|--|--|--|
| | | Sketch of Sample | | | | | |
| | Apollo Mission/ Collection Site | | | | | | |
| | Texture | | | | | | |
| | Colors | | | | | | |
| | Size | | | | | | |
| | Shape | | | | | | |
| | Classification | | | | | | |
| | Origin | | | | | | |

My Own Rock Chart

| Interpretations | | Observations | | | | | |
|-----------------|----------------|-----------------|---------|--------|------|-------|-------------|
| Origin | Classification | Collection Site | Texture | Colors | Size | Shape | Rock Sketch |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Moon ABCs Fact Sheet

| Property | Earth | Moon | Brain Busters |
|---------------------|--|---|---|
| Equatorial diameter | 12,756 km | 3,476 km | How long would it take to drive around the Moon's equator at 80 km per hour? |
| Surface area | 510 million square km | 37.8 million square km | The Moon's surface area is similar to that of one of Earth's continents. Which one? |
| Mass | 5.98×10^{24} kg | 7.35×10^{22} kg | What percentage of Earth's mass is the Moon's mass? |
| Volume | --- | --- | Can you calculate the volumes of Earth and the Moon? |
| Density | 5.52 grams per cubic cm | 3.34 grams per cubic cm | Check this by calculating the density from the mass and volume. |
| Surface gravity | 9.8 m/sec/sec | 1.63 m/sec/sec | What fraction of Earth's gravity is the Moon's gravity? |
| Crust | Silicate rocks. Continents dominated by granites. Ocean crust dominated by basalt. | Silicate rocks. Highlands dominated by feldspar-rich rocks and maria by basalt. | What portion of each body is crust? |
| Mantle | Silicate rocks dominated by minerals containing iron and magnesium. | Similar to Earth. | Collect some silicate rocks and determine the density. Is the density greater or lesser than the Earth/Moon's density? Why? |

Moon ABCs Fact Sheet

| Property | Earth | Moon | Brain Busters |
|--|---|--|--|
| Core | Iron, nickel metal | Same, but core is much smaller | What portion of each body is core? |
| Sediment or Regolith | Silicon and oxygen bound in minerals that contain water, plus organic materials. | Silicon and oxygen bound in minerals, glass produced by meteorite impacts, small amounts of gases (e.g., hydrogen) implanted by the solar wind. No water or organic materials. | Do you think life ever existed on the Moon? Why or why not? |
| Atmosphere (main constituents) | 78 % nitrogen, 21 % oxygen | Basically none. Some carbon gases (CO ₂ , CO, and methane), but very little of them. Pressure is about one-trillionth of Earth's atmospheric pressure. | Could you breathe the lunar atmosphere? |
| Length of day (sidereal rotation period) | 23.93 hours | 27.3 Earth days | How long does daylight last on the Moon? |
| Surface temperature | Air temperature ranges from -88°C (winter in polar regions) to 58°C (summer in tropical regions). | Surface temperature ranges from -193°C (night in polar regions) to 111°C (day in equatorial regions). | Why are the temperatures of Earth and the Moon so different? |
| Surface features | 25 % land (seven continents) with varied terrain of mountains, plains, river valleys. Ocean floor characterized by mountains, plains. | 84 % heavily-cratered highlands. 16 % basalt-covered maria. Impact craters-- some with bright rays, crater chains, and rilles. | Compare maps of Earth and the Moon. Is there any evidence that plate tectonics operated on the Moon? |